International Journal of Agricultural
Science and Research (IJASR)
ISSN(P): 2250-0057; ISSN(E): 2321-0087
Vol. 6, Issue 6, Dec 2016, 23-28

TRANS STELLAR
•Journal Publications •Research Consultancy

ASSESSMENT OF WEED CONTROL TREATMENTS ON YIELD OF SOYBEAN [(GLYCINE MAX (L.)] AT TRIBAL JHABUA HILLS ZONE OF MADHYA PRADESH

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ABSTRACT

An On Farm Trial was conducted during two consecutive season of kharif 2014 and 2015 in adopted village of Krishi Vigyan Kendra, Jhabua (M.P). This OFT was conducted at 10 Farmers field with soybean variety JS 335. The results revealed that lowest weed dry matter was recorded in Imazethapyr 35 g/ha + Imazemox 35 g/ha with highest weed control efficiency of 69.22% followed by Chlorimuron 9 g/ha + Quizalof 60 g/ha (56.01%). Metribuzin + one interculture with dora at 20-25 recorded lowest weed control efficiency of 51.27%. Maximum yield obtained under Imazethapyr 35 g/ha + Imazemox 35 g/ha (14.41 q/ha) followed by Chlorimuron 9 g/ha + Quizalof 60 g/ha (14.15 q/ha) and it was higher by 41.27 and 38.73 per cent, respectively. Imazethapyr 35 g/ha + Imazemox 35 g/ha treatment fetches the highest net return of Rs 28220/ha with B:C ration of 2.47.

KEYWORDS : Weed Control, Soybean, Herbicides, Seed Yield, Net Returns and B:C ratio

Received: Sep 22, 2016; **Accepted:** Oct 15, 2016; **Published:** Oct 19, 2016; **Paper Id.:** IJASRDEC20164

Original Article

INTRODUCTION

Soybean (*Glycine max* (L.) Merrill) has emerged as a potential crop and brings prosperity of the farmers of Madhya Pradesh. The ecological condition of the state are congenial for soybean production, but the productivity is low (1293 kg/ha) as compared to national productivity of 1353 kg/ha (Agricultural Statistical at a Glance 2014). Being a rainy season crop, it suffers severely due to excessive weed infestation. Severe weed competition is one of the major constraints for low productivity of soybean. The various grassy and broad leaf weeds compete for essential nutrients, moisture, sunlight and space especially during the first 40 days after sowing. If weeds are not not controlled during critical period of crop- weed competition, there is identical reduction in the yield of soybean from 58 to 85 %, depending upon the types and intensity of weeds (Kewat *et at.*, 2000, Tiwari and Khurchania 1990).

Hand/ mechanical weeding is a traditional and effective method of weed control but untimely continuous rains and unavailability of labour at peak time are main limitations of manual weeding. In such circumstances, the only alternative that needs to be explored is the use of herbicides. Use of only single herbicides is also not so effective as some weeds escape to control due to their selectivity. Therefore, integrated weed management or herbicide mixture may broaden the window of weed management by broad-spectrum weed control

(Bineet *et al*. 2001). Malik et al. (2006) suggested that sequential application of herbicides may provide consistent weed control than single application. Therefore, On farm trails were conducted to assess the possibility of pre-emergent / post-emergent or integration of two herbicides for effective weed control in soybean was exploded.

MATERIALS AND METHODS

An On Farm Trial was conducted for consecutive two rainy seasons of 2014 and 2015 at adopted village by Krishi Vigyan Kendra, Jhabua (M.P). This OFT was conducted at 10 Farmers field with soybean variety JS 335 during both the years. Each treatment in OFT were laid out in 1000 sqm area with row to row spacing of 40 cm. The treatments in OFT were farmers practice, Chlorimuron 9 g/ha + Quizalof 60 g/ha, Imazethapyr 35 g/ha + Imazemox 35 g/ha and Metribuzin 350 g/ha (PE)+ Interculture operation. All the herbicides were applied by manually operated knapsack sprayer fitted with the flat fan nozzle using spray volume of 500 L/ha. Soybean variety JS 335 was sown in first week of July and harvested in second week of October with recommended packages of practices. Fertilizers were applied uniformly at 20, 60 and 20 kg N, P and K/ha. The observation on weed density and dry weight were recorded at 50 DAS and using quadrate of 0.25 square meter (0.5 m X 0.5 m) was randomly placed at two places in each plot. The data on weed count and weed biomass were subjected to square root transformation i.e (X +0.5), before carrying out analysis of variance and comparisons were made on transformed value. Total precipitation during kharif 2014 was 759.6 mm with 38 rainy days and 632.2 mm with only 24 rainy days during Kharif 2015while the average rainfall of the district (845 mm).

The weed control efficiency was calculated by using the following formula:

$$WCE\ (\%) = \frac{DWC - DWT}{DWC} \times 100$$

(Where, WCE= Weed control efficiency in percent, DWC= Dry matter of weeds in control plot and DWT= Dry matter of weeds in treated plot.)

RESULTS AND DISCUSSIONS

Effect on Weeds

Major weed species in soybean field were *Commelina benghalensis, Echinochloa colonum, Digera arvensis, Tridex procumbans, Celosia argentia, Dactyloctenium aegyptium, Digiteria sanguinalis, Trianthema monogyna, Phallanthus niruri* and *Cyprus rotundus* are the main weeds . The weed density revealed that broadleaf weeds were dominant in soybean during kharif 2014 while during kharif 2015 grassy weeds were dominant.

All the weed control treatments significantly reduced the dry matter of weeds over farmer practice during both the years. During Kharif 2014, Imazethapyr 35 g/ha + Imazemox 35 g/ha recorded lowest weed dry matter (24.30 g/m2), however in Khairf 2015 lowest weed dry matter was recorded in Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (13.61 g/m^2) closely followed by Imazethapyr 35 g/ha + Imazemox 35 g/ha (15.51 g/m2). The differences in the efficacy of herbicides to reduce the dry matter of weeds was might be due to dominancy of broadleaves weeds in the year 2014 and dominancy of grassy weed in kharif 2015. It was also evident by the rainfall data of both the years. During the 2014, 759.6mm rainfall received during the season while in the 2015 only 632.2 mm rainfall received. Broadleaves weeds were dominated during the high rainfall years and grassy weeds were dominated during the low rainfall years. On the basis of mean of two years, lowest weed dry matter of 19.91 g/m^2 was recorded in application of Imazethapyr 35 g/ha + Imazemox

35 g/ha closely followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (23.71 g/m^2). Imazethapyr 35 g/ha + Imazemox 35 g/ha found significantly superior over farmers practices and Metribuzin 350 g/ha (PE)+ Interculture operation with dora at 20-25 DAS. Likewise highest weed control efficiency of 62.92% was recorded in Imazethapyr 35 g/ha + Imazemox 35 g/ha followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (56.01%). Prachand *et al.*(2015) also reported higher weed control efficiency in Imazethapyr + Imazamox (56.5%) as compared to their sole herbicides of Imazethapyr 100 g/ha (49.3%) and Quizalofop-ethyl @ 50 g /ha (48.4%) .

Post emergence application of imazethapyr is responsible for inhibition of acetolactate synthase (ALS) or acetohydroxyacid synthase (AHAS) in broad leaf weeds which caused destruction of these weeds at 3-4 leaf stage (Chandel and Saxena 2001). Quizalofop-ethyl inhibits the activity of the acetyl CoA carboxylase enzyme, which is necessary for fatty acid synthesis in grassy weeds. These effects of quizalofop for controlling weeds in soybean were in confirmation with the results reported by Pandey *et al*. (2007) and Prachand *et al*. (2015).

Effect on Yield Attributes and Yield

All weed control treatments were found to be significantly affecting the various growth and yield attributing characters in soybean over farmers practice. It is revealed from Table 1 that all weed control treatments significantly enhance the plant height as compared to farmers practices. Maximum plant height was observed in Imazethapyr 35 g/ha + Imazemox 35 g/ha (47.0 cm) and it was found closely at par with Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (45.15 g/m^2). Further highest number of pods per plant and maximum yield were also observed in Imazethapyr 35 g/ha + Imazemox 35 g/ha followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha. Highest yield of 14.41 q/ha was recorded in the field treated with Imazethapyr 35 g/ha + Imazemox 35 g/ha followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (14.15 q/ha). Imazethapyr 35 g/ha + Imazemox 35 g/ha recorded 9.58 per cent higher yield over Metribuzin 350 g/ha (PE)+ Interculture operation with dora and 41.27 per cent over farmers practice. This might be due to providing favorable environment for crop with controlling weeds, which reduces the competition of crop with weeds for space, air, sunlight, moisture and nutrients. Similar results were earlier reported by Kalhapure *et al.* (2011) and Singh *et al*. (2015).

Economics

Among the weed control treatments, Imazethapyr 35 g/ha + Imazemox 35 g/ha fetches the highest net returns (Rs 28220/-) followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (Rs 27619/-). The B: C ration was maximum under Imazethapyr 35 g/ha + Imazemox 35 g/ha net returns (2.47) followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (2.45) and Metribuzin 350 g/ha + Interculture operation with dora at 20-25 DAS (2.18). The lowest B:C ration was recorded in farmers practices (1.73). The low investment under Imazethapyr 35 g/ha + Imazemox 35 g/ha coupled with good economic yield might be the reason for higher net monetary return and Benefit Cost ratio over other weed control practices. Similar finding had also been reported by Kewat *et at*. (2000) and Tiwari *et al.* (2007)

CONCLUSIONS

The results of this experiment revealed that among the weed management practices, application of Imazethapyr @ 35 g /ha + Imazamox @ 35 g/ha was the best weed management practice in soybean to obtain greater yield (14.41 q/ha) and higher B:C ratio (2.47) closely followed by Chlorimuron Ethyl 09gm /ha + Quizalofop-ethyl 50 g /ha. Highest weed control efficiency of 62.92% was also recorded in Imazethapyr 35 g/ha + Imazemox 35 g/ha followed by Chlorimuron 9 g/ha + Quizalof – ethyl 60 g/ha (56.01%).

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APPENDICES

Table 1: Effect of Weed Management Practices on Weed Dry Matter and Weed Control Efficiency at 50 DAS

Treatments	Weed Dry Matter (g/m2)			Weed Control Efficiency		
	2014	2015	Mean	2014	2015	Mean
T1- Farmer practice	54.50	52.42	53.46			
T2- Chlorimuron 9 g/ha + Quizalofop 60 g/ha (PoE)	33.80	13.61	23.71	37.98	74.04	56.01
T3- Imazethapyr 35 g/ha + Imazemox 35 g/ha (PoE)	24.30	15.51	19.91	55.41	70.42	62.92
T4- Metribuzin 350 g/ha (PE)+ Interculture operation with dora at 20-25 DAS	28.00	24.16	26.08	48.62	53.91	51.27
CD	**7.72**	3.96	5.84	-	-	

Table 2: Effect of Weed Management Practices on Plant Height, Pods/ Plant and Yield of Soybean

Treatments	Plant Height (cm)			Pods/ Plant (No.)			Yield (q/ha)		
	2014	2015	Mean	2014	2015	Mean	2014	2015	Mean
T1- Farmer practice	34.70	30.50	32.6	22.10	18.70	20.40	11.10	9.29	10.20
T2- Chlorimuron 9 g/ha + Quizalofop 60 g/ha (PoE)	44.90	45.40	45.15	33.30	37.90	35.6	13.99	14.30	14.15
T3- Imazethapyr 35 g/ha+ Imazemox 35 g/ha (PoE)	52.80	41.20	47.0	40.70	35.20	37.95	15.24	13.58	14.41
T4- Metribuzin 350 g/ha (PE)+ Interculture operation with dora at 20-25 DAS	46.60	38.90	42.75	37.50	31.20	34.35	14.32	11.97	13.15
CD at 5%	5.02	3.83	4.43	4.26	3.66	3.96	0.70	1.46	1.08

Table 3: Effect of Weed Management Practices on Economics of Soybean Crop

Treatments	Net Returns (Rs/ha)			B:C Ratio		
	2014	2015	Mean	2014	2015	Mean
T1- Farmer practice	16545	11611	14078	1.87	1.58	1.73
T2- Chlorimuron 9 g/ha + Quizalofop 60 g/ha (PoE)	26068	29170	27619	2.39	2.50	2.45
T3- Imazethapyr 35 g/ha + Imazemox 35 g/ha (PoE)	29893	26547	28220	2.58	2.35	2.47
T4- Metribuzin 350 g/ha (PE)+ Interculture operation with dora at 20-25 DAS	26324	20298	23311	2.35	2.00	2.18